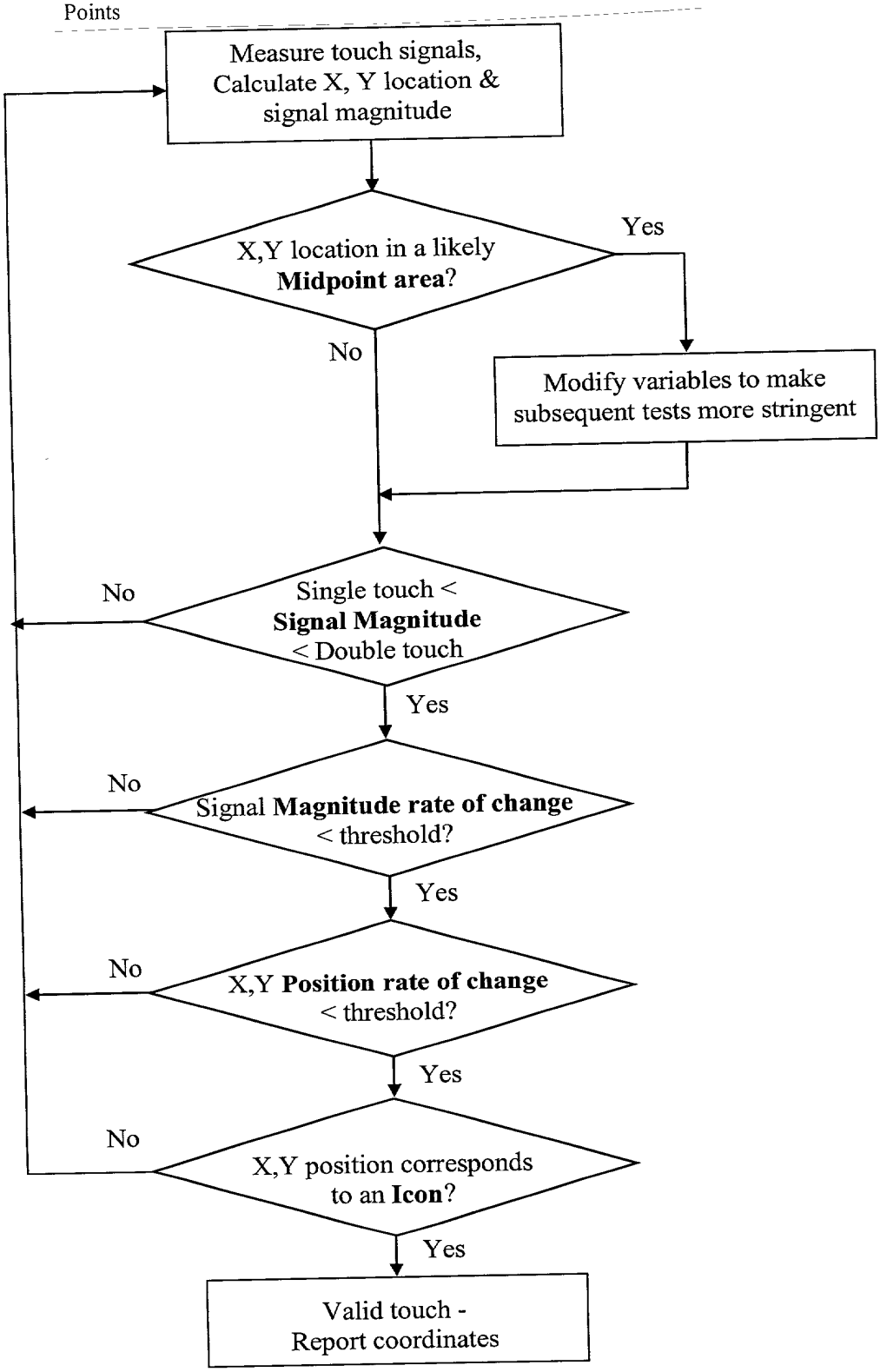
Measure touch signals, Calculate X, Y location & signal magnitude
X,Y location in a likely **Midpoint area**?
Yes
No
Modify variables to make subsequent tests more stringent
Single touch < **Signal Magnitude** < Double touch
No
Yes
Signal **Magnitude rate of change** < threshold?
No
Yes
X,Y **Position rate of change** < threshold?
No
Yes
X,Y position corresponds to an **Icon**?
No
Yes
Valid touch - Report coordinates

Fig. 1

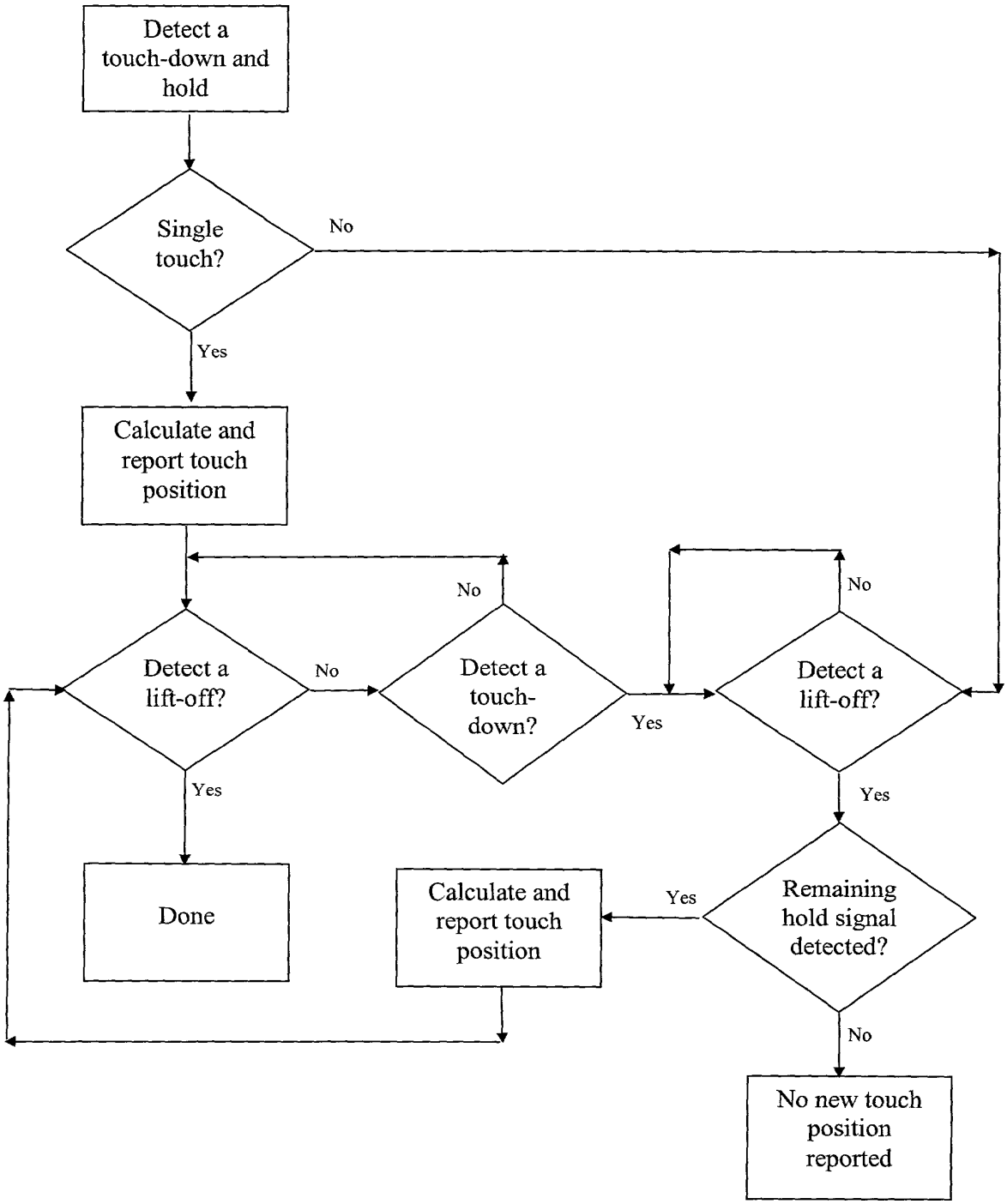
Detect a touch-down and hold
Single touch?
No
Yes
Calculate and report touch position
Detect a lift-off?
No
Yes
Done
Detect a touch-down?
No
Yes
Detect a lift-off?
No
Yes
Remaining hold signal detected?
Yes
Calculate and report touch position
No
No new touch position reported

Fig. 2

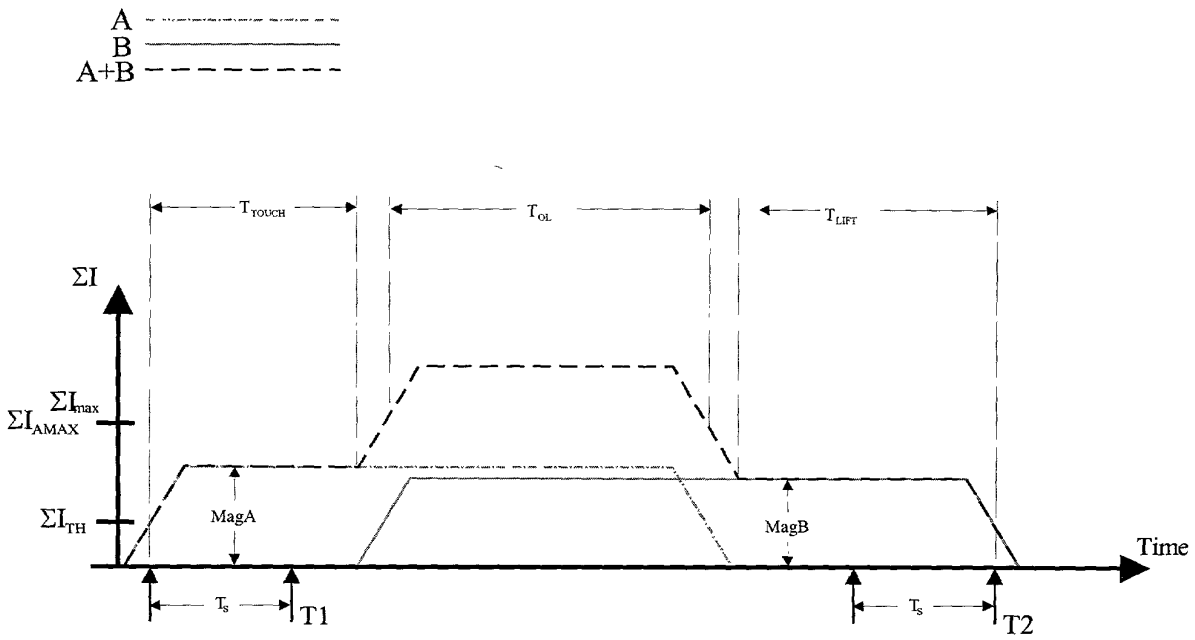

Fig. 3A

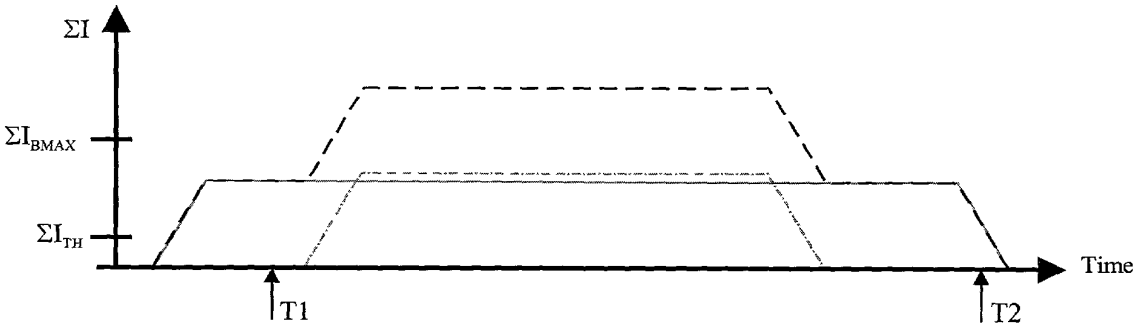

Fig. 3B

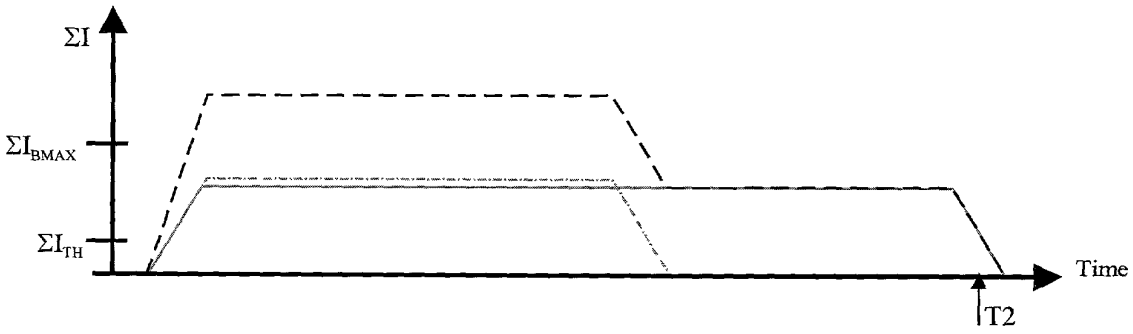

Fig. 3C

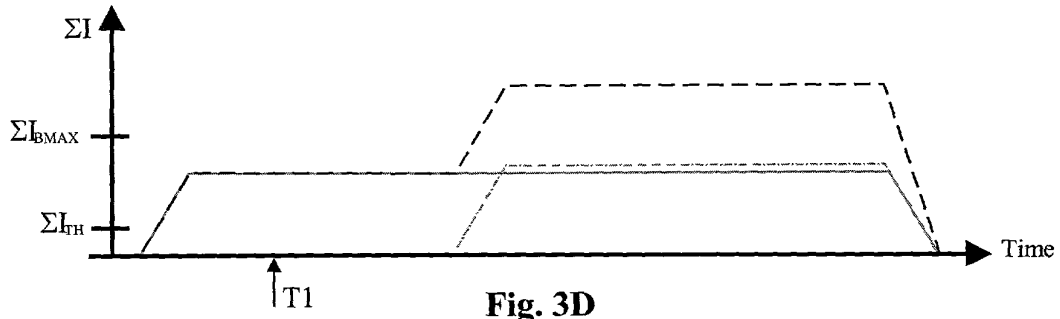

Fig. 3D

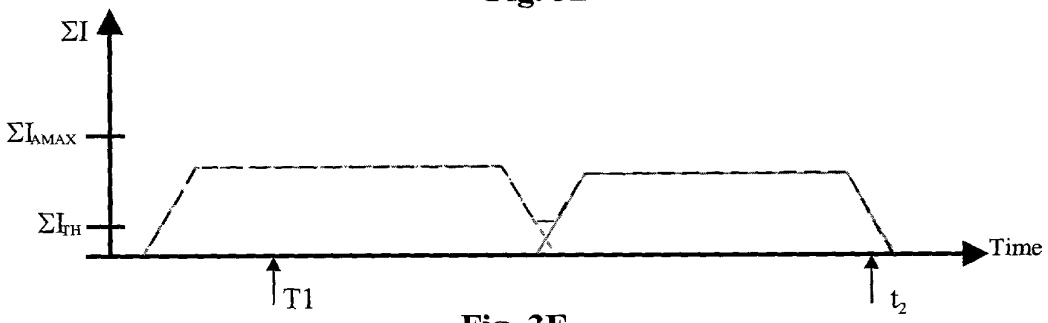

Fig. 3E

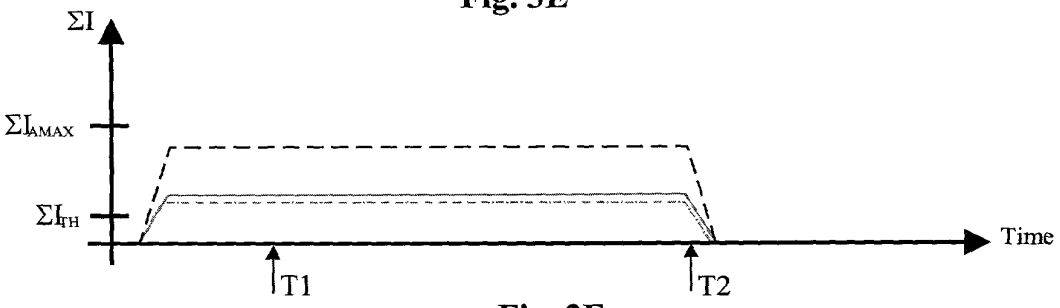

Fig. 3F

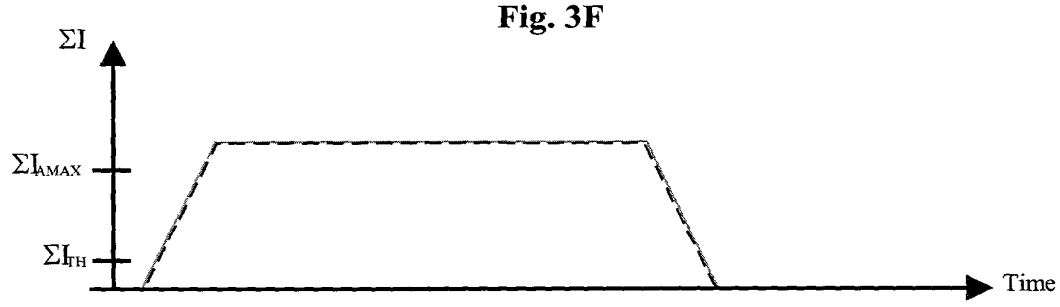

Fig. 3G

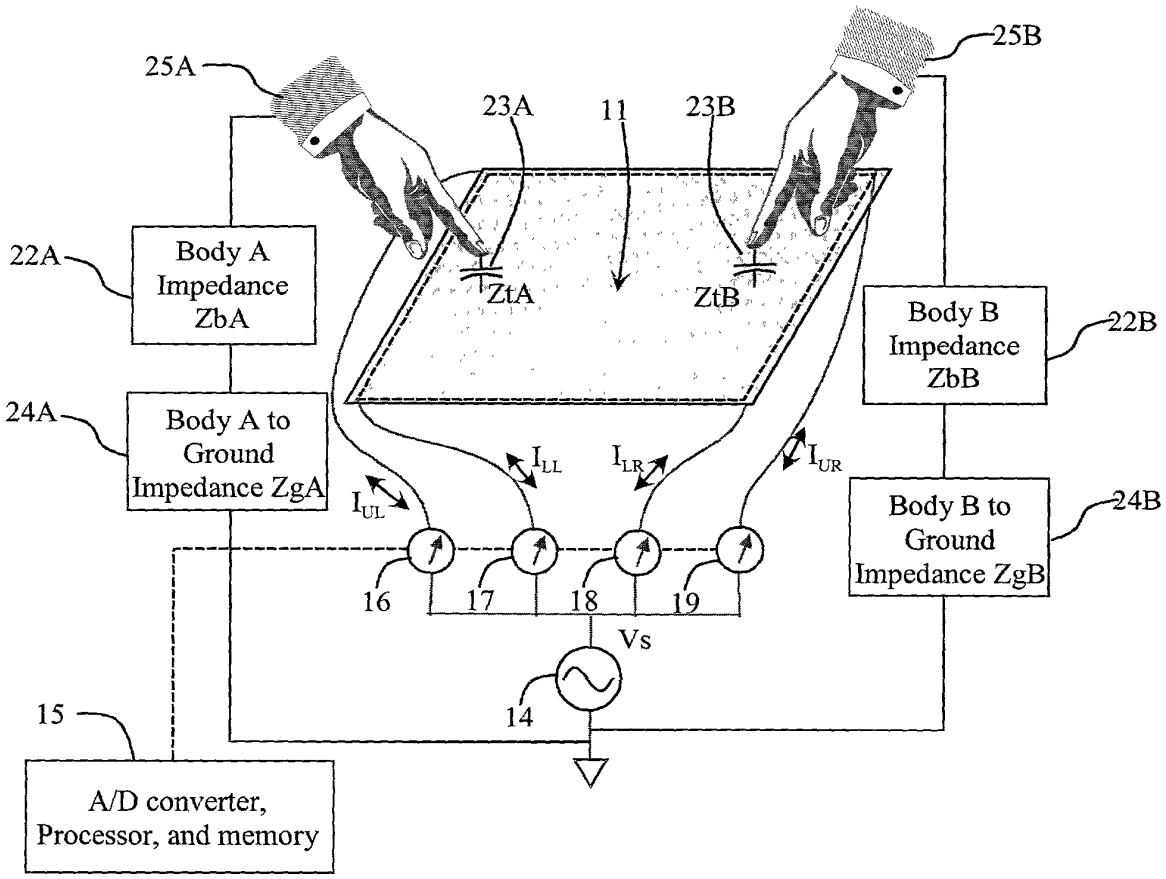
25A
25B
23A
11
23B
22A
Body A Impedance ZbA
ZtA
ZtB
Body B Impedance ZbB
22B
24A
Body A to Ground Impedance ZgA
I_{LL}
I_{LR}
I_{UR}
I_{UL}
Body B to Ground Impedance ZgB
24B
16
17
18
19
Vs
14
15
A/D converter, Processor, and memory

Fig. 4

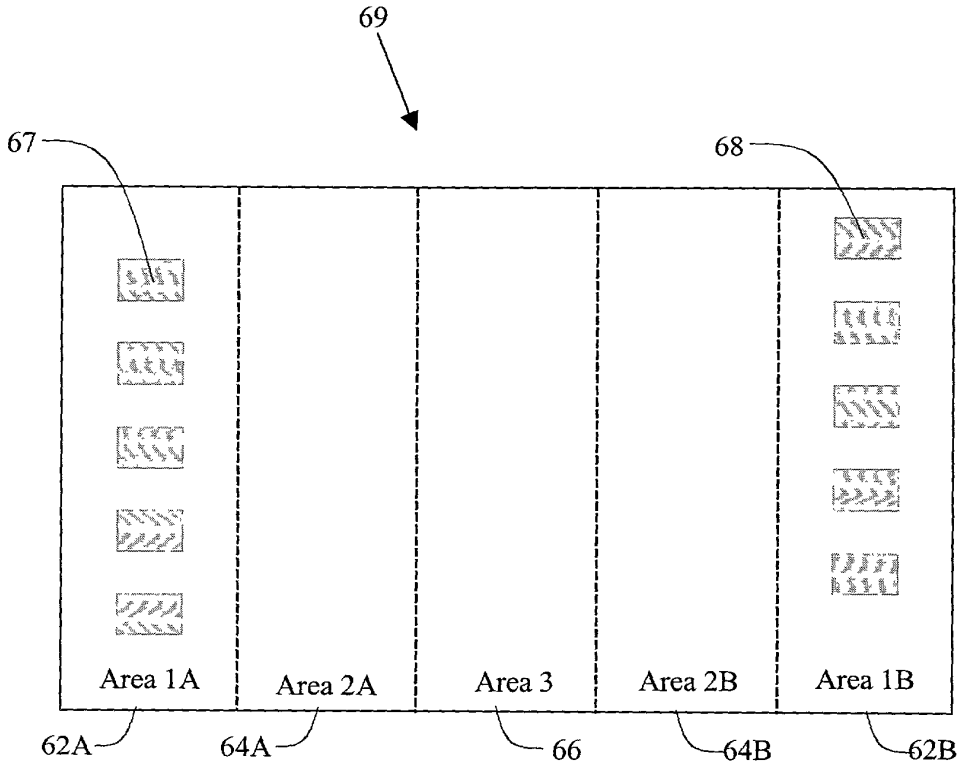

Fig. 5

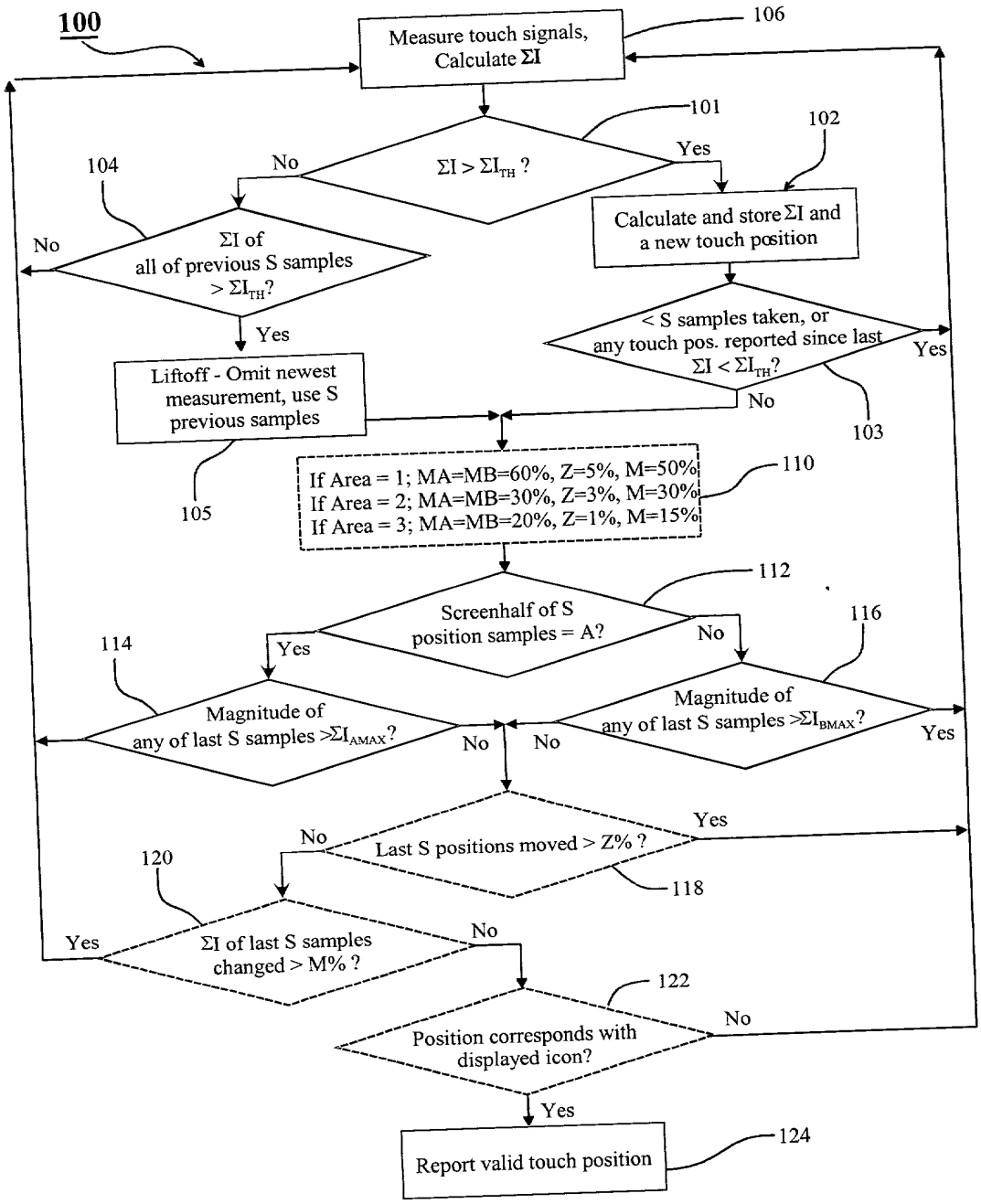
100
Measure touch signals, Calculate ΣI
106
ΣI > ΣI_TH ?
101
Yes
No
102
104
Calculate and store ΣI and a new touch position
ΣI of all of previous S samples > ΣI_TH?
No
Yes
< S samples taken, or any touch pos. reported since last ΣI < ΣI_TH?
Yes
No
103
Liftoff - Omit newest measurement, use S previous samples
105
If Area = 1; MA=MB=60%, Z=5%, M=50%
If Area = 2; MA=MB=30%, Z=3%, M=30%
If Area = 3; MA=MB=20%, Z=1%, M=15%
110
Screenhalf of S position samples = A?
112
Yes
No
114
116
Magnitude of any of last S samples >ΣI_AMAX?
Magnitude of any of last S samples >ΣI_BMAX?
No
No
Yes
Last S positions moved > Z% ?
Yes
No
118
120
ΣI of last S samples changed > M% ?
Yes
No
122
Position corresponds with displayed icon?
No
Yes
Report valid touch position
124

Fig. 6

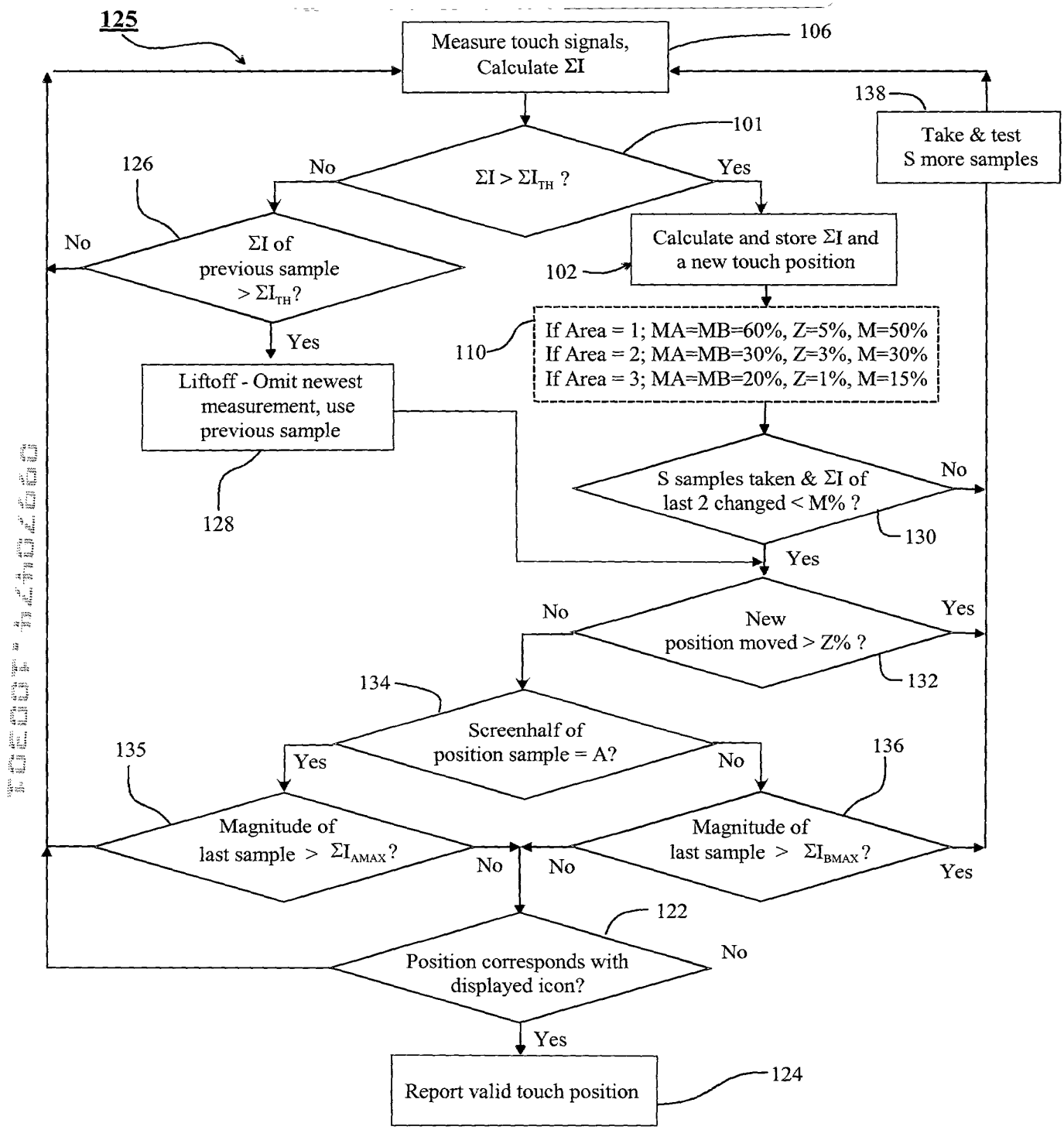
125
Measure touch signals, Calculate ΣI
106
138
Take & test S more samples
101
ΣI > ΣI_TH ?
No
Yes
126
ΣI of previous sample > ΣI_TH?
No
Yes
Calculate and store ΣI and a new touch position
102
If Area = 1; MA=MB=60%, Z=5%, M=50%
If Area = 2; MA=MB=30%, Z=3%, M=30%
If Area = 3; MA=MB=20%, Z=1%, M=15%
110
Liftoff - Omit newest measurement, use previous sample
128
S samples taken & ΣI of last 2 changed < M% ?
No
130
Yes
New position moved > Z% ?
No
Yes
132
134
Screenhalf of position sample = A?
Yes
No
135
136
Magnitude of last sample > ΣI_AMAX?
Magnitude of last sample > ΣI_BMAX?
No
No
Yes
122
Position corresponds with displayed icon?
No
Yes
Report valid touch position
124

Fig. 7

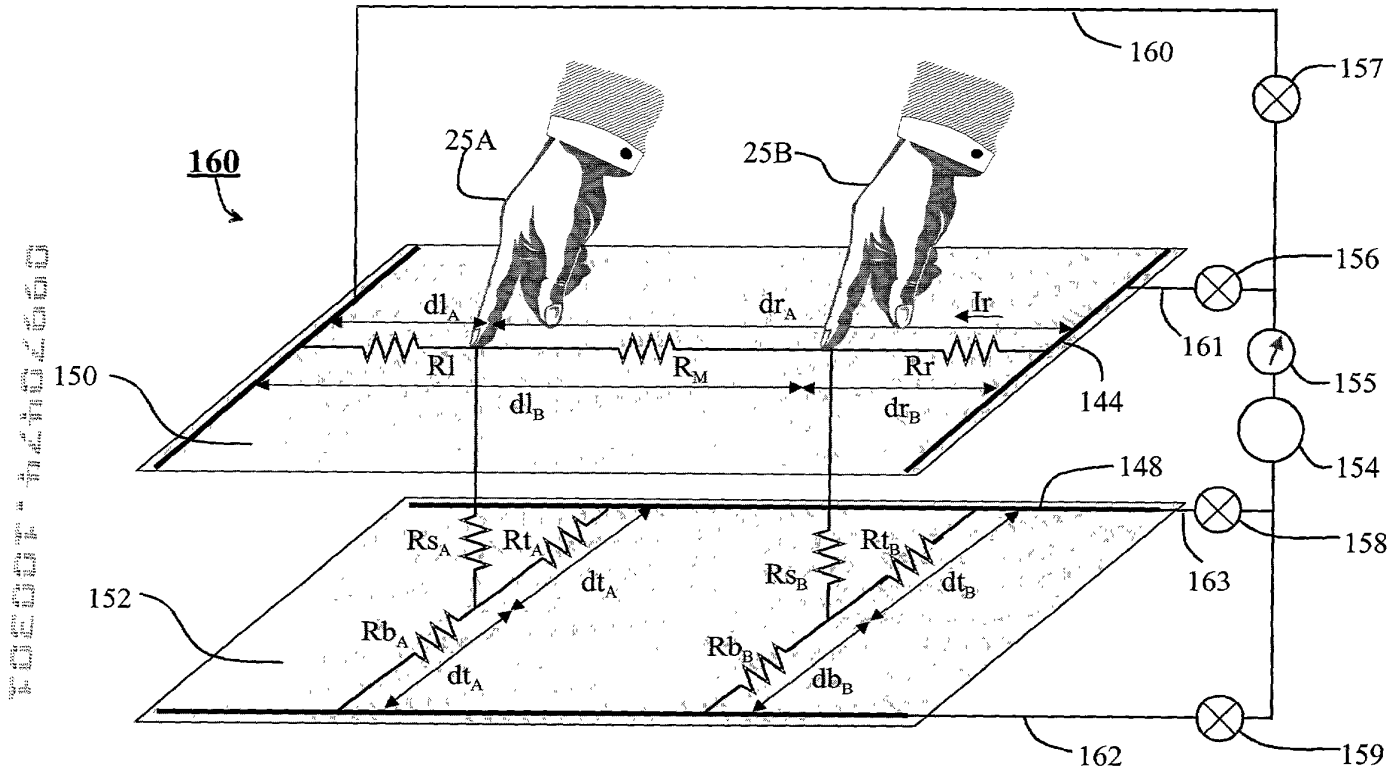
160
160
157
25A
25B
156
dl_A
dr_A
Ir
161
Rl
R_M
Rr
155
150
dl_B
dr_B
144
154
148
Rs_A
Rt_A
Rs_B
Rt_B
158
152
dt_A
dt_B
163
Rb_A
Rb_B
dt_A
db_B
162
159

Fig. 8

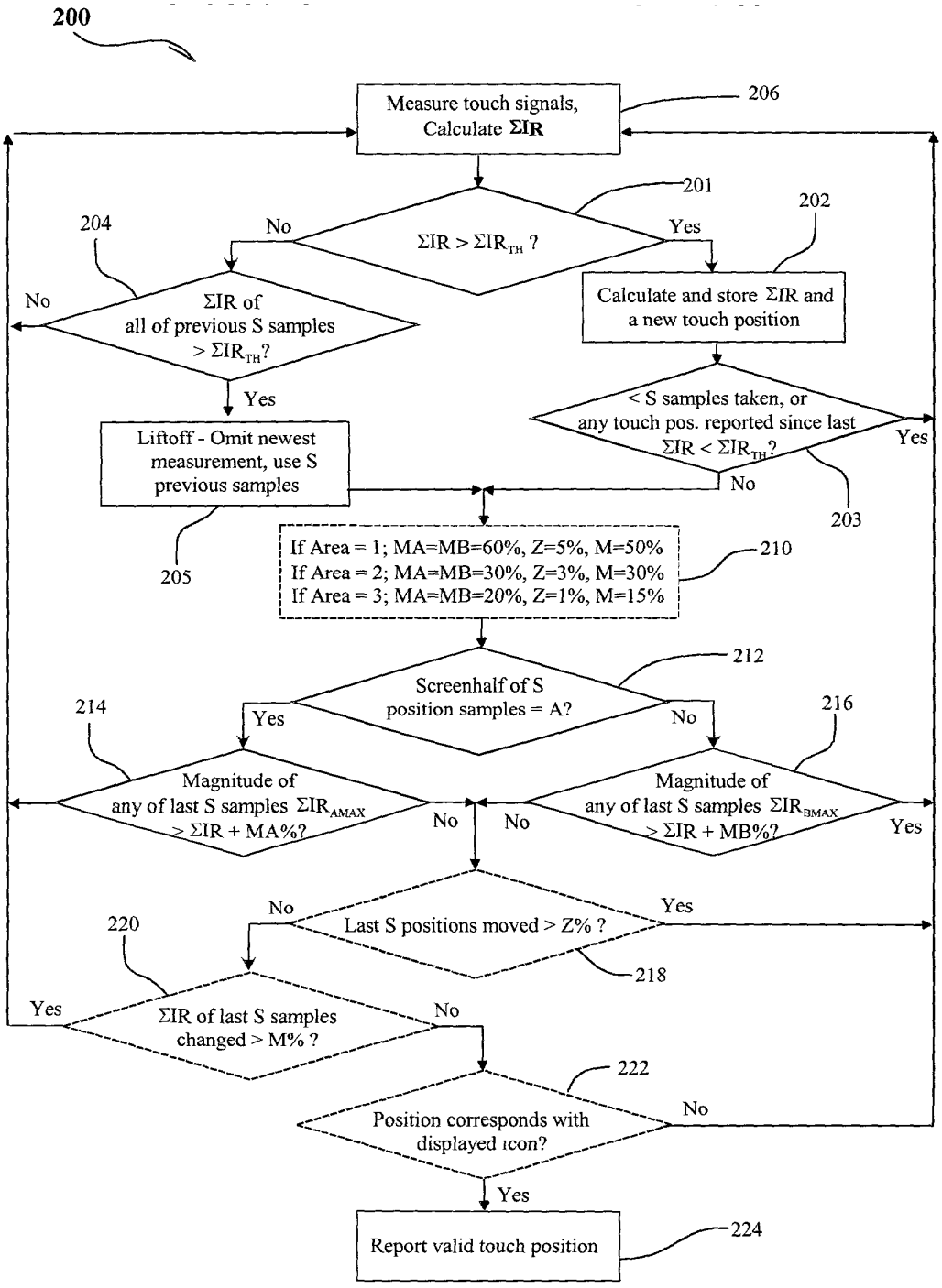
200
Measure touch signals, Calculate ΣIR
206
201
ΣIR > ΣIR_TH ?
No
Yes
202
204
ΣIR of all of previous S samples > ΣIR_TH?
No
Yes
Calculate and store ΣIR and a new touch position
< S samples taken, or any touch pos. reported since last ΣIR < ΣIR_TH?
Yes
No
203
Liftoff - Omit newest measurement, use S previous samples
205
If Area = 1; MA=MB=60%, Z=5%, M=50%
If Area = 2; MA=MB=30%, Z=3%, M=30%
If Area = 3; MA=MB=20%, Z=1%, M=15%
210
212
Screenhalf of S position samples = A?
Yes
No
214
216
Magnitude of any of last S samples ΣIR_AMAX > ΣIR + MA%?
No
No
Magnitude of any of last S samples ΣIR_BMAX > ΣIR + MB%?
Yes
No
Last S positions moved > Z% ?
Yes
218
220
Yes
ΣIR of last S samples changed > M% ?
No
222
Position corresponds with displayed icon?
No
Yes
Report valid touch position
224

Fig. 9

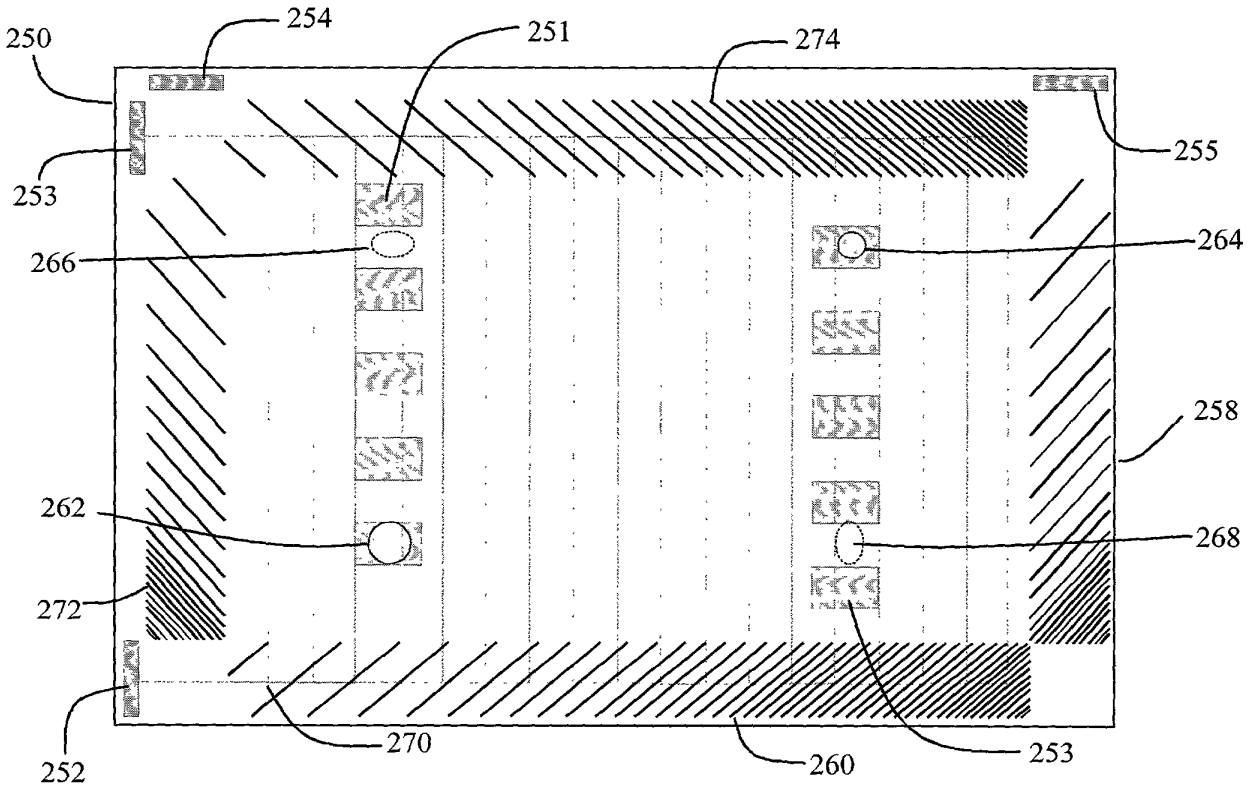

Fig. 10

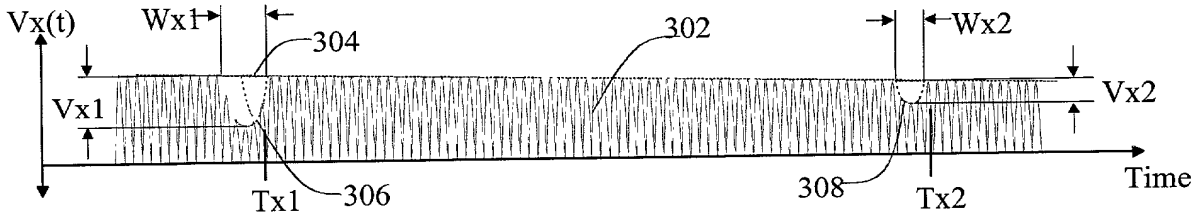

Fig. 11A

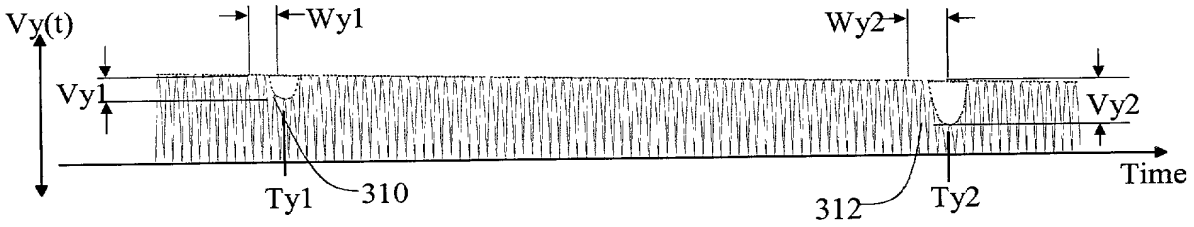

Fig. 11B

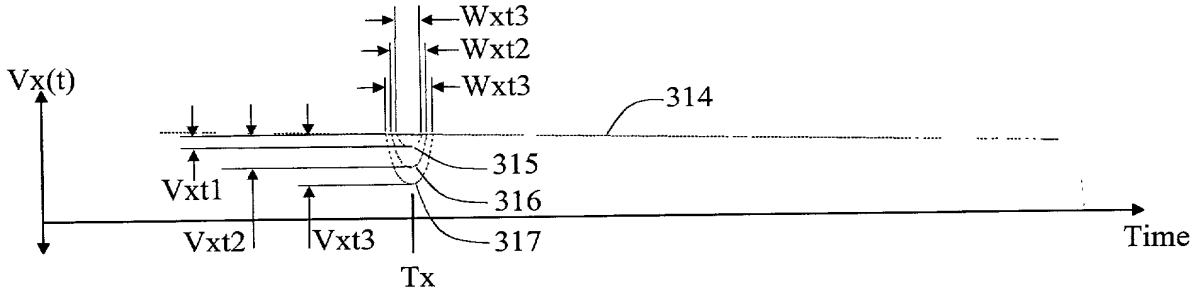

Fig. 11C

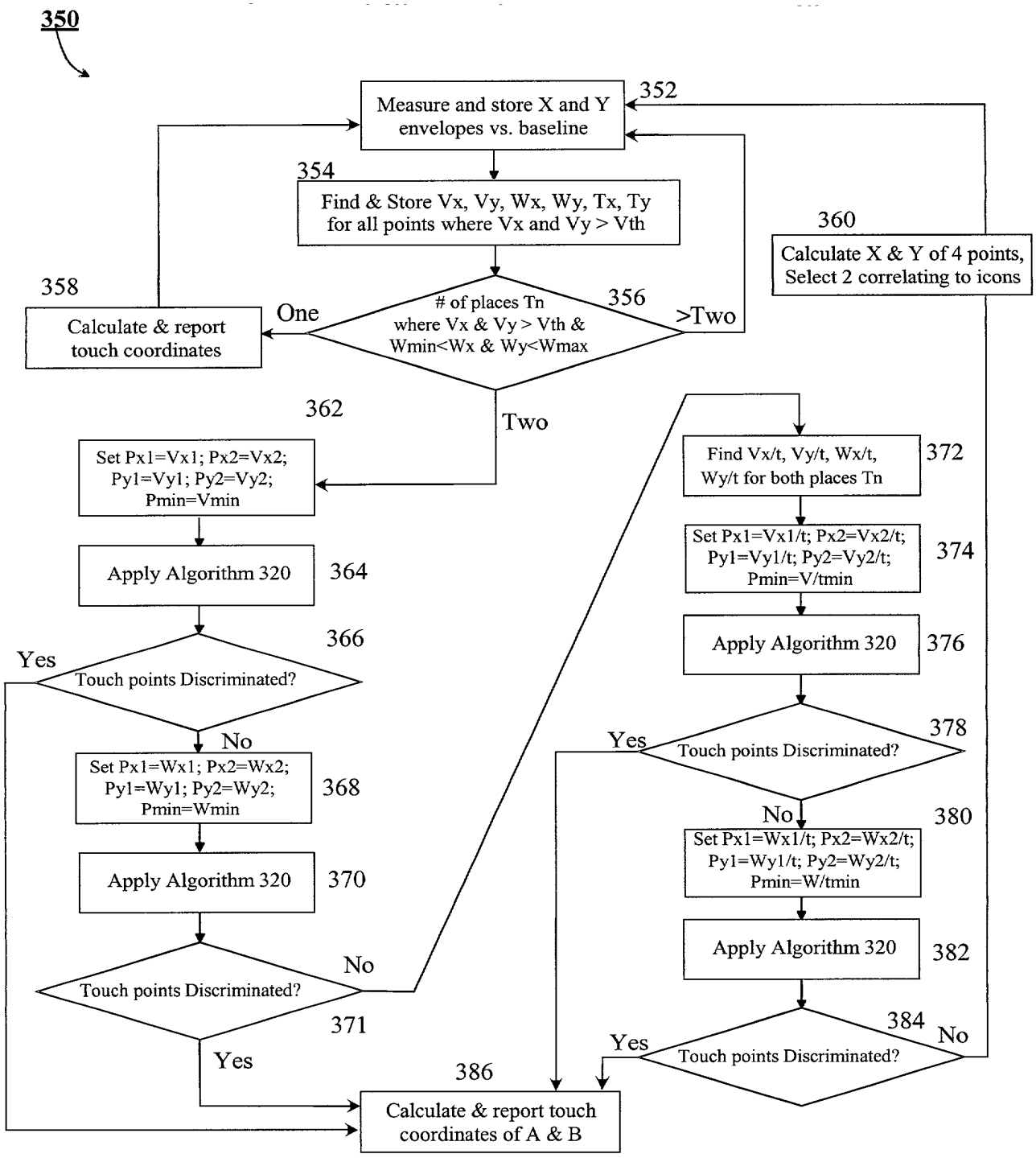
350
Measure and store X and Y envelopes vs. baseline
352
Find & Store Vx, Vy, Wx, Wy, Tx, Ty for all points where Vx and Vy > Vth
354
# of places Tn where Vx & Vy > Vth & Wmin<Wx & Wy<Wmax
356
One
>Two
Two
Calculate & report touch coordinates
358
Calculate X & Y of 4 points, Select 2 correlating to icons
360
Set Px1=Vx1; Px2=Vx2; Py1=Vy1; Py2=Vy2; Pmin=Vmin
362
Apply Algorithm 320
364
Touch points Discriminated?
366
Yes
No
Set Px1=Wx1; Px2=Wx2; Py1=Wy1; Py2=Wy2; Pmin=Wmin
368
Apply Algorithm 320
370
Touch points Discriminated?
371
No
Yes
Find Vx/t, Vy/t, Wx/t, Wy/t for both places Tn
372
Set Px1=Vx1/t; Px2=Vx2/t; Py1=Vy1/t; Py2=Vy2/t; Pmin=V/tmin
374
Apply Algorithm 320
376
Touch points Discriminated?
378
Yes
No
Set Px1=Wx1/t; Px2=Wx2/t; Py1=Wy1/t; Py2=Wy2/t; Pmin=W/tmin
380
Apply Algorithm 320
382
Touch points Discriminated?
384
Yes
No
Calculate & report touch coordinates of A & B
386

Fig. 12

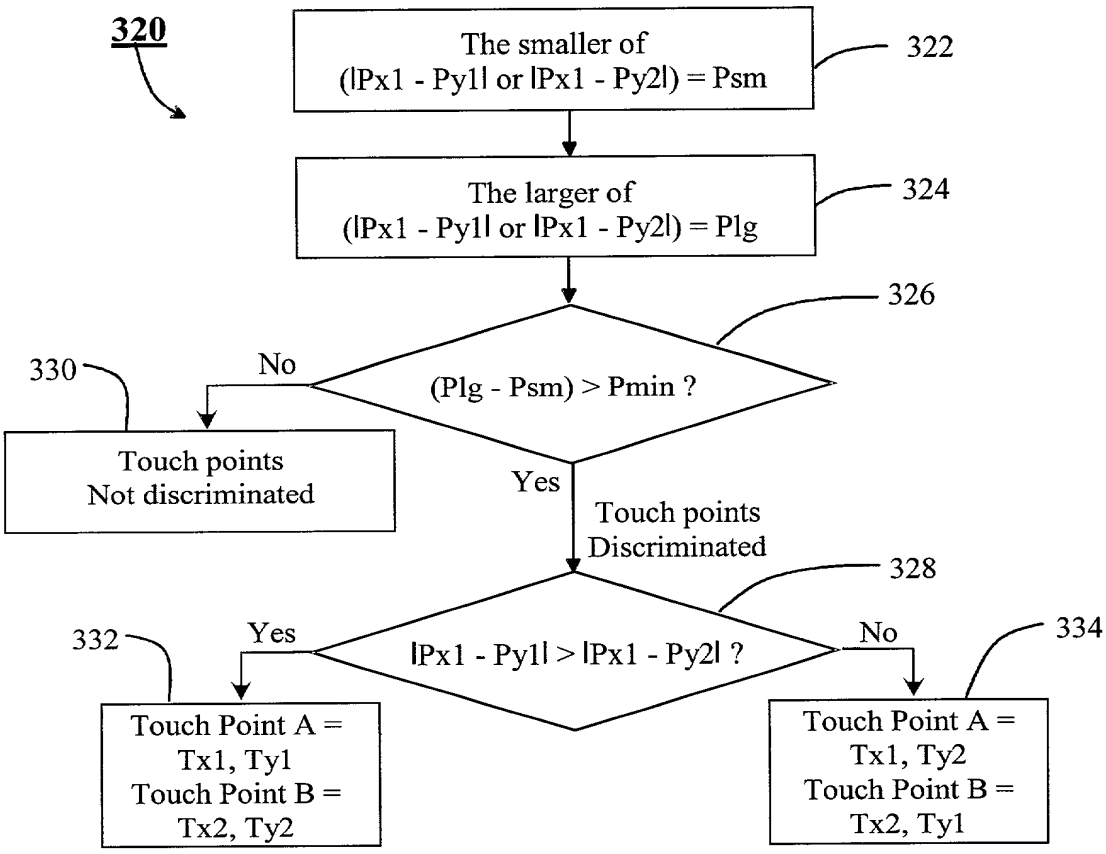
320
The smaller of
(|Px1 - Py1| or |Px1 - Py2|) = Psm
322
The larger of
(|Px1 - Py1| or |Px1 - Py2|) = Plg
324
326
(Plg - Psm) > Pmin ?
No
330
Touch points
Not discriminated
Yes
Touch points
Discriminated
328
|Px1 - Py1| > |Px1 - Py2| ?
Yes
332
No
334
Touch Point A =
Tx1, Ty1
Touch Point B =
Tx2, Ty2
Touch Point A =
Tx1, Ty2
Touch Point B =
Tx2, Ty1

Fig. 13